CLASSIFICATION RESTRICTED
SECURITY INFORMATION
CENTRAL INTELLIGENCE AGENCY
INFORMATION FROM
FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT
CD NO.

COUNTRY USSR
SUBJECT Economic; Technological - Railroad equipment
HOW PUBLISHED Book
WHERE PUBLISHED Moscow
DATE PUBLISHED 1950
LANGUAGE Russian

DATE OF INFORMATION 1925 - 1950
DATE DIST 29 Jul 1953
NO. OF PAGES 8
SUPPLEMENT TO REPORT NO.

THIS IS UNEVALUATED INFORMATION

SOURCE Organizatsiya Vagonnovo Khozyaystva (Organization of Railroad Car Management), N. Z. Krivoruchko. Transzheldorizdat, Moscow, 1950, pp 116-37, Appendix tables 1 and 2

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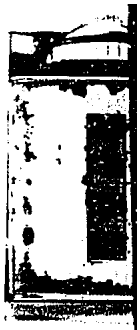

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USSR USES PROGRESSIVE METHOD IN RAILROAD CAR REPAIRING

The repair of railroad cars by the progressive method was first introduced in 1925 in the Tambov Car Repair Plant. Since then, it has been widely accepted by Soviet car repair plants and repair yards.

A further development of the progressive method was the introduction of the unit subassembly method, by which a defective unit is replaced by a repaired unit which has been assembled previously on a special jig or bench, and which then is delivered to the proper position on the track were it is installed on the car. This method was first introduced in 1948 in the Darnitsa Car Repair Plant in reconditioning two-axle boxcars.

The entire process of repairing a two-axle boxcar by the progressive method is carried out in five positions. The car is completely stripped in the first position. Except for the door posts, which are left intact provided they need not be replaced, all posts are removed. The roof of the car is removed by means of a bridge crane and placed on a special jig where it is repaired.

In the second position, the frame and the end sills are repaired. The end sills are removed from the car itself and repaired on a bench, after which they are again installed on the car as complete units.

In the third position, the car is raised; the wheels are replaced; the brake gear and all accessories, the journal boxes, and the bearings are mounted; and the liners and packing are installed.

In the fourth position, sides previously prepared and painted are attached to the car, and the posts are riveted to the bracket angles and end sills. Part of the floor is laid.

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In the fifth position, laying of the floor is completed. A bridge crane is used to place the repaired and painted roof on the car. After the posts are riveted to the angles, the doors are hung on the sides. The automatic brakes are given a final testing and the foundation brake gear is regulated. Upon completion of this work, the car is delivered to the inspector.

A car remains in each position 4 hours; it takes 20 hours to recondition a two-axle boxcar.

The capital repair of a four-axle freight car, which takes 32 hours, is broken down into eight operations carried out by special crews. A repaired car leaves the track every 4 hours.

The methods employed by the Kanash Car Repair Plant in making capital repairs on four-axle boxcars and those employed by the Moscow Car Repair Plant imeni Voytovich in making capital repairs on four-axle passenger cars are examples of the progressive method of repairing cars.

In the case of boxcars, the wooden parts of the car and the roof are removed completely in the first position. This includes the floor, the inside lining, the molding, and the roof carline fillers. The metal posts and the carlines are unbolted and, after the posts and roof are removed, the body and frame are cleaned of rust and mud.

In the second position, the car is stripped of its metal parts and the rivets are removed. The worn-out metal parts of the frame, the doors, and the trap doors are removed, the brake gear parts and the automatic brake are dismantled, the bolts are loosened, and the rivets are cut out. If necessary, the frame and body are straightened.

In the third position, the car is lifted either by an overhead crane or by electric jacks, and is placed on steel stands. The trucks are removed from under the car and are sent to the truck shop for repairs. The draft gear and automatic coupling equipment is disassembled completely, the center sill is repaired at the backstop, and the body center-plate is either repaired or replaced. By having a supply of previously repaired trucks on hand at this position, the Kanash Car Repair Plant is able to maintain a continuous and uninterrupted repair schedule. Cars can be placed on trucks 2 hours after being lifted from their original trucks.

The fourth position involves welding, riveting, and erecting work. In addition, the brake equipment is mounted.

Both the fifth and sixth positions involve carpentry and erecting work. The fifth position includes the laying of the floor, the installation of the lining and molding, the hanging of doors, and the placing of draft gears and automatic couplers. As part of the sixth operation, the lining is bolted, the automatic brakes are tested, and a selected spot is painted for stenciling. About 1,000 bolts and nuts are necessary to install the floor and lining in a four-axle boxcar. In this position there is a scaffold which is raised and lowered by means of an electric motor, to facilitate the work.

The principal work done in the seventh position is the laying of the roof on the car and the painting of the sides, the body, and the roof. To facilitate the roof work, there is a special scaffold along the entire length of the car. This scaffold is 3,100 millimeters from the top of the track rail and 600 millimeters from roof level. All preparatory roof work is done on this scaffold.

In the eighth position, the car is painted for the second time, is stenciled, and is completed for delivery to the inspector of the Ministry of Railways.

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The following table gives a schedule of capital repairs on a four-axle boxcar repaired by the progressive method. It lists the various operations and the skills involved, the number of workers in the crew, the time it takes to carry out specified repairs, and the man-hours involved in each operation and position.

Type of Work	Skills	Number of Workers	Time Involved (hours)	Man-Hours
First Position				
Lift car, place on benches; roll trucks out	Fitters	2	0.25	0.5
Remove friction draft gear	"	2	3	6
Remove doors, hatch covers, stringers, coupler handles, door rails	"	2	0.5	1
Dismount hand and automatic brake	Brake-equipment fitter	1	4	4
Replace body center plate and side bearings	Fitters	2	4	8
Fit and rivet around center pin, center-sill and plate, and coupling	Boilersmiths /Riveters?/	4	4	16
Remove and fit parts with acetylene torch; perform gas welding work	Welder	1	4	4
Replace removed trucks; drop car on trucks	Fitters	2	0.25	0.5
				40
Second Position				
Repair frame by fitting and riveting	Boilersmiths	2	4	8
Drill and ream holes	Reamer	1	4	4
Install brake cylinder; assemble brake gear	Brake-equipment fitters	2	4	8
				20
Third Position				
Repair body by fitting and riveting	Boilersmiths	2	4	8
Perform electrical welding work on body	Welders	2	4	8

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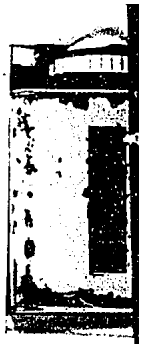
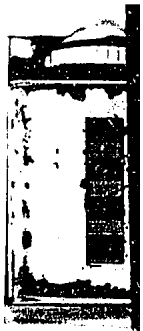


Type of Work	Skills	Number of Workers	Time Involved (hours)	Man-Hours
Third Position				
Install door guides, door rails, and stringers	Fitters	2	4	8
Assemble friction draft gear	"	2	2	4
Assemble air pipes and brake equipment	Brake-equipment fitters	2	4	8
				36
Fourth Position				
Paint underframe and posts; lay floor; install side, front, and rear end lining; install carline fillers, door posts, cornice, and roof lining	Carpenters	8	4	32
Hang and fit doors and hatches	Fitters	2	4	8
				40
Fifth Position				
Bore holes and bolt lining and floor	Carpenters	8	4	32
Hang and fit doors and hatches	Fitters	2	4	8
				40
Sixth Position				
Test automatic brake with car inspector	Brake-equipment fitter	1	4	4
Cover roof with sheet iron and install chimney flashing	Roofers	2	4	8
Prepare car for painting by application of filler	Painters	2	2	4
				16
Seventh Position				
Apply first coat of paint to car	"	2	2	4
Dry car in paint-drying shed	"	-	2	-
				4
Eighth Position				
Apply second coat of paint	"	2	1	2
Dry car	"	-	3	-



Type of Work	Skills	Number of Workers	Time Involved (hours)	Man-Hours
Eighth Position				
Stencil car and deliver to inspector	Painters	2	1	2
Prepare and load compressorless paint tank for future work	"	2	2	4
				8
Total man-hours				204

The repair of passenger cars by the progressive method involves a great many complications, but the experiences of the more advanced car repairing enterprises, such as the Moscow Car Repair Plant imeni Voytovich, clearly show that this method is both possible and economical. Capital repairs on passenger cars are carried out in seven positions at this enterprise. Six of these positions are located in the erection department and the seventh is in the paint shed.

In the first position, a passenger car is stripped completely. The draft gear, the hand and automatic brakes, and the metal sides are removed; the wooden parts of the body, the heating system, the water pipes, and the internal fixtures are all disassembled; and the roof is removed from the car. A jib crane is located in this position to remove the heating apparatus and to transport heavy components. To facilitate the work, this position is also equipped with a three-tier movable scaffold.

In the second position, the body of the car is separated from the underframe. The underframe and trucks are rolled out from under the body, the underframe is raised, and the trucks are changed. Work is performed on the body, the frame is repaired, the draft gear is installed, the underframe is lowered on trucks previously repaired in the truck shop, and the body is attached to the underframe. The heating apparatus is installed. A car remains in this position 2 days.

In the third position, work on the body is completed. Work is done also on the heating arrangement, and the body is inspected by the inspector. A car remains in this position 2 days.

In the fourth position, where the car also remains 2 days, the metal side sheets are reinforced, the assembly of the heating equipment is completed, the doors are installed, the furniture is repaired and assembled, and the exterior of the car is cleaned and primed for painting.

In the fifth position, the interior trimming is completed. The window frames are installed, locks and door handles are attached, electric light fixtures are connected, and automatic brakes are tested. Following this, the interior of the car is cleaned and primed for painting. The exterior is given a second and third application of ground coat. A car remains in this position 2 days.

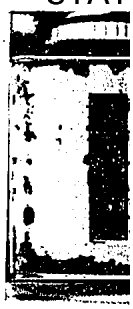
A car also remains 2 days in the sixth position, where work is done on the roof, the platform lights and tail gates are installed, the interior is given a second and third application of ground coat, and the exterior is rubbed.

In the seventh position, in which a car remains 5 days, all the paint work, interior and exterior, is completed and the car is lettered. The interior of the car is given two applications of paint and a touch-up job; the exterior is given two applications of paint and an application of lacquer.

The ordinary layover time for a four-axle passenger car undergoing capital repairs is established as 16 one-shift work days.

The following table gives a schedule of capital repairs made on a four-axle hard-seat passenger car. It lists the various operations and the skills involved, the number of workers in the crew, the time it takes to carry out specified repairs, and the man-hours involved in each operation.

Type of Work	Skills	Number of Workers	Time Involved (hours)	Man-Hours
First Position				
Disassemble rails and tail gates	Fitters	2	2	4
Disassemble hand and automatic brakes	"	2	4	8
Disassemble automatic coupling apparatus and buffers	"	2	2	4
Disassemble window frames	Carpenters	2	8	16
Disassemble door locks	Fitters	2	3	6
Disassemble electrical equipment	Electricians	2	4	8
Disassemble water pipes and lavatories	Fitters	2	6	12
Remove exterior metal sheets	Straighteners	2	8	16
Remove vestibule and interior doors	Carpenters	2	8	16
Disassemble roof and ventilators	Roofers	4	8	32
Disassemble heating equipment	Steam pipe-fitters	5	8	40
Disassemble interior furnishings	Carpenters	4	4	16
Remove body from frame	Bodymen	2	2	4
Place body on stands, roll out trucks	Fitters	2	1	2
Repair under frame	Fitters, welders	4	8	32



Type of Work	Skills	Number of Workers	Time Involved (hours)	Man-Hours
First Position				
Inspect underframe	Fitters	2	1	2
Roll trucks back under frame, lower body on trucks, and adjust trucks	"	4	3	12
Install automatic coupling apparatus and buffers	Fitters	2	2	4
Second Position				
Dismantle exterior wooden face boards	Bodymen	4	5	20
Dismantle floor and interior lining	"	6	5	30
Repair crossties	Carpenters	6	8	48
Replace floor and interior lining	Bodymen	6	8	48
Replace exterior wooden face boards	"	4	8	32
Replace exterior sheet metal	Straighteners	12	8	96
Assemble heating equipment	Steam pipe-fitters	3	14	42
Install interior furnishings	Carpenters	2	12	24
Adjust vestibule doors	"	2	4	8
Install guard rails and tail gates	Fitters	2	4	8
Third Position				
Cover roof and assemble ventilators	Roofers	6	5	30
Assemble water pipes and lavatories	Fitters	2	8	16
Install window frames	Carpenters	3	12	36
Install electrical equipment	Electricians	2	8	16
Hang and fit doors	Carpenters	2	8	16
Install door locks	Fitters	1	4	4

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Type of Work	Skills	Number of Workers	Time Involved (hours)	Man-Hours
Third Position				
Rub exterior and apply ground coat	Painters	2	8	16
Install and test brakes	Fitters	2	8	16
Apply filler to external sides and primer to roof	Painters	5	4	20
Apply ground coat to interior	"	6	6	36
Paint roof	"	2	4	8
Putty sides of interior	"	6	6	36
Putty sides of exterior, second application	"	4	4	16
Putty sides of exterior, third application	"	4	4	16
Paint floor and sides of interior	"	6	8	48
Fourth Position				
Apply second coat of paint to roof	"	2	4	8
Paint running gear	"	2	8	16
Rub and prime sides of exterior	"	2	8	16
Apply paint to sides of interior, second coat	"	5	8	40
Apply fixol /finishing varnish?/ to sides of exterior, first coat	"	2	8	16
Touch up and lacquer sides of interior	"	5	8	40
Apply fixol to sides of exterior, second coat	"	2	8	16
Paint floor, second coat	"	4	8	32
Letter car	"	1	4	4
Turn car over to inspector of Ministry of Railways	--	--	--	--
Total man-hours				1,032

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